Chapter

2

FACILITY INVENTORY

Chapter

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FACILITY INVENTORY

for the Airport Master Plan
at Grand Canyon West Airport

2.0 INTRODUCTION

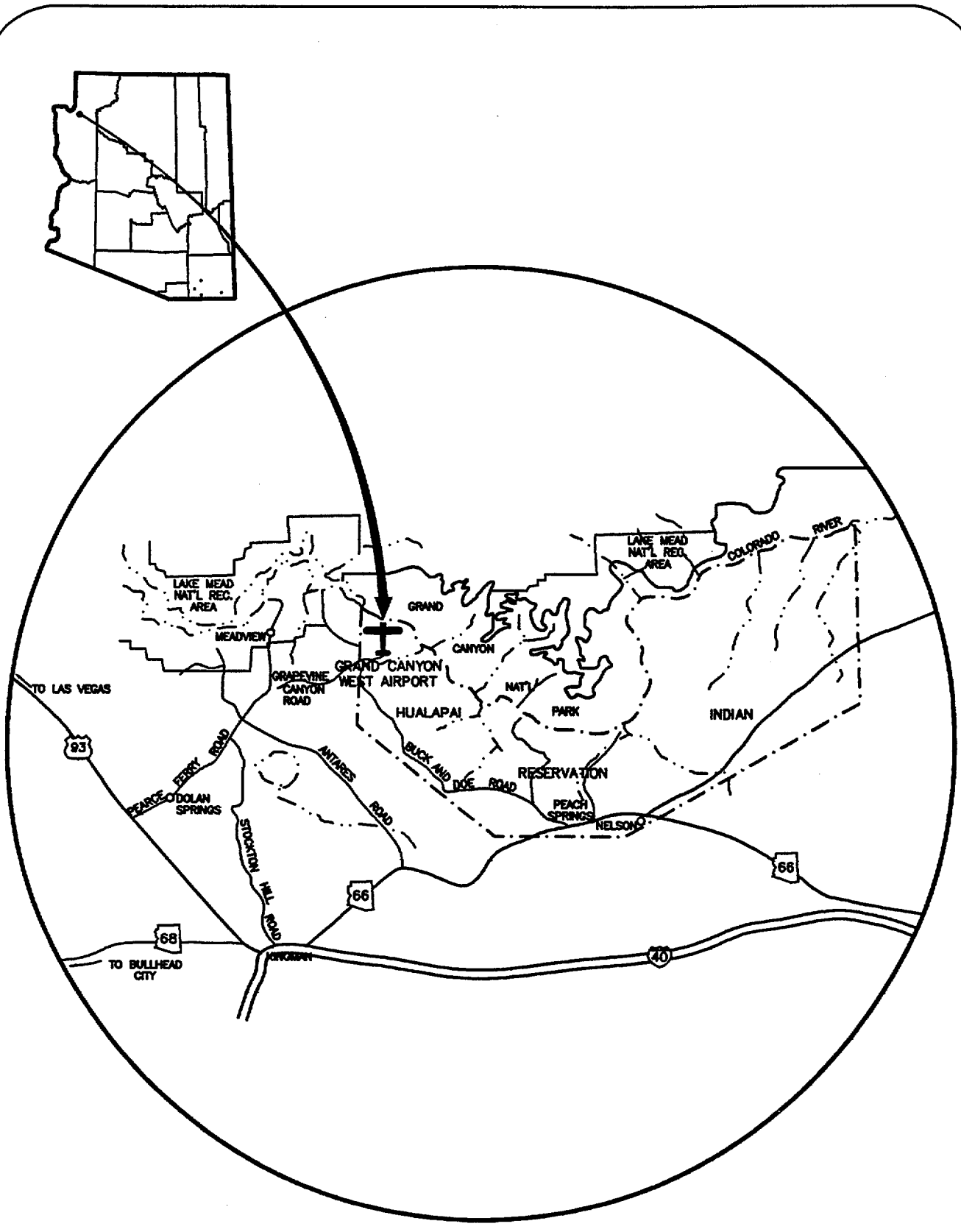
This chapter will document the collection and evaluation of information pertaining to several aspects of the Grand Canyon West Airport. The result of assembling and preparing this basic data (including an examination of physical characteristics of the airfield, surrounding land uses, and a socioeconomic profile of the area) will be a comprehensive source of information for future tasks in the Master Plan. The information in the inventory was obtained through on-site inspections, review of existing plans and documents, and interviews with the existing Airport Committee members, airport management personnel, tour operators, various Peach Springs, Kingman, Mohave County, and Hualapai Nation officials, and economic development personnel.

2.1 EXISTING AIRPORT CHARACTERISTICS

2.1.1 Location

Grand Canyon West Airport is located in the northwestern portion of Arizona in Mohave County. The airport is located approximately 45 miles northwest of Peach Springs, on the south rim of the Grand Canyon, on the Hualapai Indian Reservation. Figure 2-1 provides a graphic depiction of the location of this airport in relation to nearby surface access and the Cities of Peach Springs and Kingman.

The Grand Canyon West Airport property contains approximately 164 acres. The property is located in a portion of Sections 17 and 20, Township 30 North, Range 14 West of the Gila and Salt River Base and Meridian. Grand Canyon West Airport is designated by the FAA as Site Number 00749.*A and is a public airfield. The airport location is 35° 59' 31.956" North Latitude and 113° 48' 59.819" West Longitude, according to FAA Form 5010-1, Airport Master Record.



GRAND CANYON WEST

VICINITY MAP

FIGURE 2-1
VICINITY MAP

2.1.2 Topography

Grand Canyon West Airport is at an elevation of 4,825 feet Mean Sea Level (MSL). It consists of slightly rolling topography with natural desert-type vegetation. The existing runway slopes upward towards the south with rising terrain continuing off the south end of the runway. Adjacent to the airport property to the east, the terrain drops vertically over 3,000 feet into the south rim of the Grand Canyon. To the north, the terrain continues relatively flat for approximately 3,800 feet, then slightly rising up to Guano Point, a popular scenic overlook. Southeast of the airport lies Quartermaster Point, another popular scenic overlook. Along the Grand Canyon rim lies three miles of viewing trails connecting Quartermaster and Guano Points.

2.2 CURRENT AIRPORT USERS/AIRPORT REFERENCE CODE

2.2.1 Fleet Mix

Aircraft fleet mix is the relative percentage of operations conducted by each of the four classes of aircraft shown in Table II-1 : Class A, Class B, Class C, and Class D. Table II-1 explains the type of aircraft found in each of these classes.

Based on the best available data, operations at the Grand Canyon West Airport consisted primarily of Class A and B operations. No operations at the airport were performed by Class C or Class D aircraft.

TABLE II-1
AIRCRAFT CLASSIFICATION

Aircraft Classification	Description
Class A	Single-engine (less than 12,500 pounds maximum certified takeoff weight - MCTW).
Class B	Multi-engine (less than 12,500 pounds MCTW).
Class C	Large Multi-engine (12,500 to 300,000 pounds MCTW). Includes corporate jets
Class D	Heavy multi-engine (300,000 pounds MCTW or more).

Source: FAA AC 150/5060-5 Airport Capacity and Delay

2.2.2 Airport Reference Code

The Airport Reference Code (ARC) is a system established by the FAA which is used to relate airport design criteria to the operational and physical characteristics of the aircraft currently operating and/or intended to operate at the airport. The ARC has two components relating to the airport design aircraft. The first component, depicted by a letter, is the Aircraft Approach Category and correlates to aircraft approach speed (operational characteristic). The second component, depicted by a Roman numeral, is

the Aircraft Design Group and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways (primarily length) and runway facilities. Aircraft wingspan is primarily associated with separation criteria involving taxiways and taxilanes. Table II-2 has been included to provide a definition of both Aircraft Approach Categories and Aircraft Design Groups.

TABLE II-2
AIRCRAFT APPROACH CATEGORIES & DESIGN GROUPS

AIRCRAFT APPROACH CATEGORY: An aircraft approach category is a grouping of aircraft based on an approach speed of 1.3 times the stall speed of the aircraft at the maximum certified landing weight.

Aircraft Category	Approach Speed
Category A	Speed less than 91 knots
Category B	91 knots or more but less than 121 knots
Category C	121 knots or more but less than 141 knots
Category D	141 knots or more but less than 166 knots
Category E	166 knots or more

AIRCRAFT DESIGN GROUP: The aircraft design group subdivides aircraft by wingspan. The aircraft design group concept links an airport's dimensional standards to aircraft approach categories or to aircraft design groups or to runway instrumentation configurations. The aircraft design groups are:

Design Group	Aircraft Wingspan
Group I	Up to but not including 49 feet
Group II	49 feet up to but not including 79 feet
Group III	79 feet up to but not including 118 feet
Group IV	118 feet up to but not including 171 feet
Group V	171 feet up to but not including 214 feet
Group VI	214 feet up to but not including 262 feet

Source: FAA 150/5300-13, Airport Design

To ensure that all facilities at the Grand Canyon West Airport are designed to accommodate the current and expected air traffic and to meet FAA criteria, the specific ARC for the airport must be determined. In order to designate a specific ARC for an airport, aircraft in that ARC must perform a minimum of 500 annual operations. Therefore, an evaluation of current aircraft using the Grand Canyon West Airport was made. A list of these aircraft types along with their specific ARC are listed in Table II-4. At the Grand Canyon West Airport, the aircraft types which use Runway 17/35 and have a minimum of 500 operations annually are those aircraft within the ARC of B-I that weigh 12,500 pounds or less. As recommended development occurs, the design aircraft group is expected to increase to a C-III, and increase to those aircraft weighing up to 60,000 pounds, then to a C-III weighing more than 60,000 pounds. Table II-3 provides examples of aircraft which fall into the A-I & B-I, and A-II & B-II, and B-III

& C-III Airport Reference Codes. The maximum certified takeoff weight for each representative aircraft has also been included as a reference to the aircraft classification system.

TABLE II-3
ARC & AIRCRAFT CLASSIFICATION
EXAMPLE AIRCRAFT

EXAMPLE AIRCRAFT HAVING AN ARC OF A-I OR B-I			
Aircraft	**Approach Speed (Knots)**	**Wingspan (Feet)**	**Max. T.O. Weight (Pounds)**
Beech Baron 58P	101	37.8	6,200
Beech Bonanza V35B	70	33.5	3,400
Beech King Air B100	111	45.9	11,799
Cessna 150	55	33.3	1,670
Cessna 177	64	35.5	2,500
Cessna 421	96	41.1	7,500
Cessna Citation I	108	47.1	11,850
Gates Learjet 28/29	120	42.2	15,000
Mitsubishi MU-2	119	39.1	10,800
Piper Archer II	86	35.0	2,500
Piper Cheyenne	110	47.6	12,050
Rockwell Sabre 40	120	44.4	18,650
Swearingen Merlin	105	46.3	12,500
EXAMPLE AIRCRAFT HAVING AN ARC OF A-II OR B-II			
Aircraft	**Approach Speed (Knots)**	**Wingspan (Feet)**	**Max. T.O. Weight (Pounds)**
Beech E-18	87	49.2	8,750
Beech King C90-1	100	50.3	9,650
Beech Super King Air	103	54.5	12,500
Beech 1900	120	54.5	15,245
Cessna 441	100	49.3	9,925
Cessna Citation II	108	51.6	13,300
Cessna Citation III	114	50.6	17,000
Dassault Falcon 50	113	61.9	37,480
Dassault Falcon 200	114	53.5	30,650
De Havilland Twin Otter 300	75	65.0	12,500
Embraer Brasilia	92	64.9	23,800

TABLE II-3 (continued)
ARC & AIRCRAFT CLASSIFICATION
EXAMPLE AIRCRAFT

EXAMPLE AIRCRAFT HAVING AN ARC OF B-III OR C-III			
Aircraft	Approach Speed (Knots)	Wingspan (Feet)	Max. T.O. Weight (Pounds)
BAe 146-100	113	86.4	74,600
BAe 146-200	117	86.4	88,250
Boeing 727-100	125	108.0	169,000
Boeing 737-200	137	93.0	115,000
Fokker F-27	102	95.2	45,000
Fokker F-28-6000	113	82.3	73,000
McDonnel Douglas DC-9-20	124	93.3	98,000

Source : AC 150/5300-13, Airport Design

TABLE II-4
AIRCRAFT USING GRAND CANYON WEST AIRPORT

Aircraft Type	Aircraft Owner/Sponsor	ARC[1]
Cessna 206, 207	Air Vegas	A-I
Cessna 206, 207	Lake Meade Air	A-I
Cessna 207	Scenic Air	A-I
Cessna 208	Scenic Air	A-II
DHC-6-300 Twin Otter	Scenic Air	A-II
Beech 99	Air Vegas	B-I
Cessna 402	Air Vegas	B-I
AS 350 BA	Maverick Helicopters	N/A

[1]*ARC: Airport Reference Code*

2.3 AIRSIDE CHARACTERISTICS

The airside facilities of an airport are described as the runway configuration, the associated taxiway system, the ramp and aircraft parking area, and any visual or electronic approach navigational aids. Figure 2-2 provides a graphic depiction of the existing facilities at the Grand Canyon West Airport.

2.3.1 Runways

Grand Canyon West Airport currently has one runway. Runway 17/35 is 5,200 feet long and 100 feet wide, and classified as a dirt airstrip. The runway slopes 1.58% downward to the north. The runway surface consists of hard packed dirt intermixed with loose dime to quarter-sized stones and gravel. The

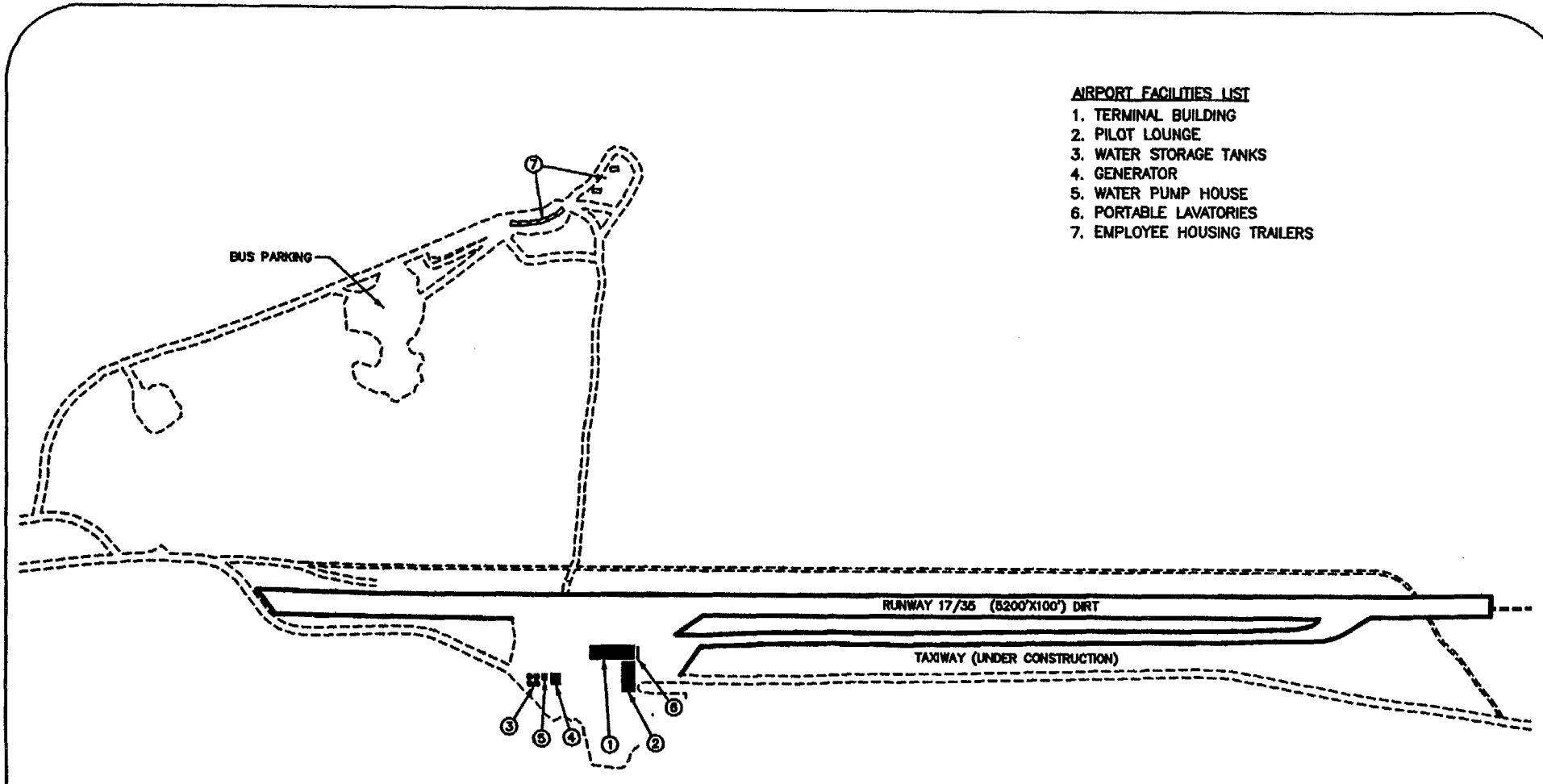


FIGURE 2-2
AIRPORT FACILITIES

runway surface presents a damage risk to all but the most rugged of aircraft. The poor condition of the runway has resulted in damage to aircraft; including propeller nicks; dings, dents, and scratches to aircraft fuselages; and excessive wear on the leading edges of aerodynamic surfaces. As a result, several carriers have discontinued service to Grand Canyon West. Airport maintenance personnel frequently blade the runway using an on-site road grader to try to minimize large stones. As a result of the blading, stone berms approximately two feet high have been deposited along the runway edges.

2.3.2 Taxiways

The stone berms along the runway edges have been cleared in two locations, (north and south of the aircraft parking apron) to provide runway exit taxiways and access to the parking apron.

A partial parallel taxiway is under construction extending three quarters the length of the runway from the north end of the aircraft parking apron towards the approach end of Runway 17. This taxiway is also dirt and gravel and is being constructed to a width of 35 feet. The runway-taxiway separation of this taxiway is currently 120 feet.

2.3.3 Aircraft Apron

The Grand Canyon West Airport currently has one aircraft parking apron. The apron is immediately adjacent to the runway and lies between the terminal building and the runway. The aircraft parking apron surface also consists of hard packed dirt intermixed with dime to quarter-sized stones. The apron has approximately 6,700 square yards (S.Y.) of usable space and has two aircraft tie-downs which were installed by aircraft operators.

2.3.4 Airfield Lighting

Guidance on airport lighting standards is provided in FAA Advisory Circular (AC) 150/5340-24. Airport lighting enhances safety during periods of inclement weather and nighttime operations by providing visual guidance to pilots in the air and on the ground.

Several common airfield lighting features of general aviation airports include a rotating beacon (activated by photoelectric cell for dusk to dawn operations), Medium Intensity Runway Lights (MIRLs) activated by aircraft radio signal, threshold lights and Runway End Identifier Lights (REILs) which mark the runway threshold with flashing strobe lights, Medium Intensity Taxiway Lights (MITLs) and/or retroflective markers, and Precision Approach Path Indicators (PAPIs) to provide descent guidance information during an approach to the runway.
The Grand Canyon West Airport currently does not have any airfield lighting or lighted visual aids to provide for nighttime or inclement weather operations.

2.3.5 Navigational Aids

The Grand Canyon West Airport does not currently have any ground-based navigational aids on airport property to aid pilots in enroute or terminal area operations. However, there are several navigational aids within the Grand Canyon West area (identified in Figure 2-3) which help provide directional aid to the Grand Canyon West Airport. The closest navigational aids to Grand Canyon West is the Peach Springs VORTAC (Very High Frequency Omnidirectional Range with Tactical information) approximately 24 NM to the southeast. Approximately 52 NM to the northwest is the Mormon Mesa VORTAC near Mesquite Airport, Arizona and to the west approximately 52 NM is the Boulder City VORTAC near Boulder City, Nevada. Additionally, a VOR/DME (Very High Frequency Omnidirectional Range with Distance Measuring Equipment) is located at Kingman Airport, approximately 52 NM to the southwest.

2.4 LANDSIDE CHARACTERISTICS

Landside characteristics of an airport are described as those facilities not included as airside characteristics. Examples of landside facilities are any structures adjoining the airfield, the access routes to and from the facility, terminal buildings, and auto parking areas.

2.4.1 Airport Services/Fixed Base Operations

A Fixed Base Operator (FBO) is usually a private enterprise that leases land from the airport sponsor on which to provide services to based and transient aircraft. The extent of the services provided vary from airport to airport; however, these services frequently include aircraft fueling, minor maintenance and repair, aircraft rental and/or charter services, flight instruction, pilot lounge and flight planning facilities, and aircraft tie-down and/or hangar storage.

Currently Grand Canyon West Airport does not have a Fixed Base Operator at the airport and does not offer any direct services to transient aircraft. A recently constructed pilot's lounge provides a facility for pilots to relax or prepare flight plans during extended ground times, while their passengers participate in the local sightseeing tours.

Pilots broadcast advisories and intentions to land, taxi, and depart over Unicom frequency 122.8. The Unicom is currently unmonitored.

2.4.2 Building Area

The building area at Grand Canyon West Airport has been developed along the east side of Runway 17/35. Ground vehicle access extends onto airport property from Buck and Doe Road and leads to two auto parking areas near the terminal building.

Figure 2-2 provides the existing layout of the building area and facilities at Grand Canyon West Airport. The terminal building encompasses approximately 3,840 square feet of space, half of which is public area. Located inside the terminal building are the airport operations office, a gift shop, a restroom facility, a tour information desk, a delicatessen, and a lobby area. The terminal building is utilized by passengers arriving by ground transportation as well as those arriving by aircraft.

Adjacent to the terminal building is the pilot/employee lounge which provides a work or rest area for pilots and local employees. Eight portable lavatories are situated adjacent to the terminal to the north to supplement the existing restroom facility.

Airport/Tribal Tour employee housing units are located on the west side of Runway 17/35. Eight mobile home trailers are situated at this site and are accessible via a dirt perimeter road.

Table II-5 provides a listing of specific characteristics of the buildings including those housing the existing utility infrastructure. In the tabulation, building numbers are referenced to Figure 2-2.

TABLE II-5
EXISTING BUILDING CHARACTERISTICS

Building Number	Type of Building	Approximate Height	Condition	Construction Materials	Utilities [1]
1	Terminal Building/ Office (with TV antenna)	12 feet (25 feet)	Good	Stucco/Wood	E, W, S
2	Pilot Lounge	12 feet	Good	Stucco/Wood	E, W, S
3	Water Storage Tanks (4)	10 feet	Good	Corrugated Metal/Aluminum	W
4	Generator Shed	14 feet	Good	Metal Siding	E
5	Water Pump House	9 feet	Good	Metal Siding	W
6	Portable Lavatories (8)	7 feet	Good	Molded Plastic	S
7	Trailers (8)	8 feet	Good	Metal frame, metal siding	E, W, S

[1] *Utilities = E - Electricity; W - Water; S - Septic*

2.4.3 Utilities

Due to the remote location of the Grand Canyon West Airport, public utilities are not available at the airport site. All utility requirements are currently met on site, or are transported to the site.

Electricity to the terminal building and nearby housing trailers is supplied by an 85 kilowatt (KW) generator which operates on diesel fuel. A 10,000 gallon tank provides storage for diesel fuel which is also used for the local tour busses and maintenance vehicles. A new 250 KW generator is planned for installation in the near future. Four water storage tanks with a total capacity of 20,000 gallons, 5,000 gallons each, provide potable and industrial water for the terminal and housing area. Water is resupplied via truck three times per week from Peach Springs. A septic system located north of the terminal building is utilized for domestic waste disposal. Three propane tanks, including a 5,800 gallon tank, are also available on site but are not in service at this time. Solid waste and refuse is removed weekly via dumpster sized truck from the site by Mohave Disposal, based in Kingman.

2.4.3 Aircraft Fuel Facilities

Aircraft fuel services are often provided by a Fixed Base Operator (FBO) or the airport sponsor. Combinations of 100LL and 80 Octane Aviation Gas, and/or Jet-A fuel are usually provided depending on the aircraft traffic mix. Storage for these fuels may consist of underground storage tanks, above ground storage tanks, fuel trucks, or a combination of the three.

The Grand Canyon West Airport currently does not have any aircraft fuel storage facilities, nor does it provide any aircraft fueling services.

2.4.4 Airport Fencing

The primary purpose of airport fencing is to prevent unwanted intrusions by persons or animals onto airport property. Airport fencing provides increased safety and security for the airport. It is normally installed along the perimeter of the airport property and outside any of the safety areas defined by the Federal Aviation Administration (FAA) in Advisory Circular (AC) 150/5300-13 and Federal Aviation Regulation (FAR) Part 77.

There is currently no airport fencing installed at the Grand Canyon West Airport.

2.5 ACCESS

2.5.1 Airport Access

Grand Canyon West Airport is located approximately 45 miles northwest of Peach Springs. The main regional surface routes are Interstate 40, U.S. Highway 93, and State Highway 66. Interstate 40 is a major east-west connection to the southwest. U.S. 93 runs north to south connecting Las Vegas, Bullhead City, and Kingman. State Highway 66 loops off of Interstate 40 at Kingman, traverses through Peach Springs, and connects back to Interstate 40 at Seligman.

Local access roads to Grand Canyon West Airport are depicted in Figure 2-1 and include Buck and Doe Road, a 45 mile stretch of unpaved, graded roadway, provides direct access to the airport from Peach Springs. Pearce Ferry Road provides access from U.S. Highway 93 to Grapevine Canyon Road via 17 miles of paved roadway. Grapevine Canyon Road, an unpaved roadway, stretches 13 miles through natural desert-type terrain to Grand Canyon West. This is the best access from Kingman and from other points to the west.

Stockton Hill Road, a two-lane graded roadway, extends 35 miles from Kingman intersecting five miles west of the Grapevine road intersection. Antares Road, also a two-lane graded roadway, stretches 30 miles from U.S. Highway 66, approximately 20 miles northwest of Kingman, intersecting with Pearce Ferry Road.

2.5.2 Transportation Alternatives

The main surface transportation routes to the Grand Canyon West area were described previously. These routes are used by tour companies providing motorcoach bus tours to Grand Canyon West, for the logistical resupply of water, food, and fuel to the site, and for individual automobile traffic. The main rail system for the area is provided by Burlington Northern Santa Fe Railway. The station is located in Kingman and is for freight only. Amtrak operates two routes through Arizona on rail lines owned by other companies. One of these lines runs through Kingman, Flagstaff, and Winslow in both directions. The second through Yuma, Phoenix, Tempe, Tuscon, and Benson, also in both directions.

Air cargo service is available through America West Express (Mesa Airlines), Courier Services, Inc., and United Parcel Service at the Kingman Airport.

2.6 OTHER AIRPORT CHARACTERISTICS

2.6.1 Control of Airport Property

Under current Federal and Arizona State Department of Transportation Guidelines, an airport sponsor must be able to prove their ability to control that land on which airport development has occurred or is being planned to occur, for a minimum of twenty-years.

The Grand Canyon West Airport is situated entirely on land owned and controlled by the sponsor, the Hualapai Indian Nation. All reasonably developable land surrounding the airport is on the Hualapai Indian Reservation. Therefore, the sponsor maintains adequate control of airport property for existing requirements and future development; however, adequate land use controls are not in place at this time. Land use controls are established through the adoption of zoning ordinances and/or land use plans. A zoning ordinance

2.7 AIRSPACE CHARACTERISTICS

2.7.1 Area Airports/Service Area

An airport service area is defined by the communities and surrounding areas served by the airport facility. For example, factors such as the airport's surrounding topographical features (mountains, rivers, etc.), proximity to its users, quality of ground access, required driving time to the airport, and the proximity of the facility to other airports which offer the same or similar services can all affect the size of a particular airport's service area. To define the service area for Grand Canyon West Airport, Armstrong Consultants first reviewed the airports in the area and their specific services and facilities. This information is displayed in Table II-6.

Due to the isolated location of Grand Canyon West Airport and poor condition of access roads, a service area for based aircraft does not exist. All aircraft operations at Grand Canyon West Airport are transient operations originating from various airports in Arizona and surrounding states. Kingman Airport, with upwards of 90 based private and corporate aircraft, services the surrounding community's general aviation and commercial service needs. It is not likely that a pilot would prefer to drive a farther distance over less developed access roads to Grand Canyon West. Therefore, it is not likely that aircraft will be based at Grand Canyon West to service the general aviation or commercial service needs of the communities of Peach Springs, Kingman, or the Hualapai Indian Nation.

Should any tour operators decide to base aircraft at Grand Canyon West Airport, the airport would then service communities as far away as Las Vegas, Phoenix, and other outlying metro areas. Pilots would most likely live on site at Grand Canyon West (at least on a rotating basis) and potential passengers would be brought in via motorcoach bus or arrive in private automobiles, then be flown on local sightseeing routes over the Grand Canyon.

TABLE II-6
AIRPORTS SURROUNDING GRAND CANYON WEST (GCW) AIRPORT

Airport Name and Location	Distance from GCW (in NM [1])	NPIAS Status [2]	Runway Length(s)	Pavement Type	Instrument Approaches [3]	Fuel Available
Grand Canyon West (Grand Canyon West, AZ)	N/A	GA-BU	5,200 x 100	Dirt / Gravel	VFR	None
Temple Bar (Temple Bar, AZ)	26 west	GA-BU	3,500 x 50	Asphalt	VFR	None
Grand Canyon Caverns (Peach Springs, AZ)	38 southeast	GA-BU	5,100 x 45	Dirt	VFR	None
Tuweep (Tuweep, AZ)	40 northwest	Not Listed	3,400 x 50	Dirt	VFR	None
Perkins Field (Overton, NV)	45 northwest	GA-GU	4,800 x 100	Asphalt	VFR	None
Boulder City (Boulder City, NV)	50 west	GA-BU	4,800 x 75 3,850 x 60 2,200 x 60	Asphalt Asphalt Asphalt	VFR VFR VFR	100 LL Jet
Kingman (Kingman, AZ)	52 south-southwest	CM-S	6,724 x 75	Asphalt	VOR/DME GPS RNAV	80 Octane 100 LL Jet-A
Mesquite (Mesquite, NV)	53 north-northwest	GA-BU	5,180 x 75	Asphalt	VFR	None
Seligman (Seligman, AZ)	59 southeast	Not Listed	4,500 x 60	Dirt	VFR	None
Bullhead City (Bullhead City, AZ	60 southwest	CM-S	5,060 x 60	Asphalt	VFR	100 LL Jet
Sky Harbor (Las Vegas, NV)	63 west	GA-GU	5,000 x 60	Asphalt	VFR	100 LL Jet
McCarran Intl. (Las Vegas, NV)	65 west	PR-L	14,506 x 150 9,776 x 150 8,900 x 150 5,001 x 75	Asphalt/PFC Asphalt/PFC Asphalt/PFC Asphalt/PFC	ILS,VOR, VOR/DME, GPS RNAV	100 LL Jet-A
North Las Vegas Air Terminal (Las Vegas, NV)	68 west-northwest	RL-GU	5,005 x 75 5,000 x 75	Asphalt Asphalt	VFR	100 LL Jet-A
St. George Municipal (St. George, UT)	68 north	CM-S	6,101 x 100	Asphalt/PFC	ILS/DME, VOR	100 LL Jet
Grand Canyon National Park (Grand Canyon, AZ)	81 east	PR-S	8,999 x 150	Asphalt/PFC	ILS/DME, VOR	100 LL Jet

Abbreviations included in Table II-2
[1] *NM = Nautical Miles*
[2] *NPIAS = National Plan of Integrated Airport Systems*
Categories included in table:

GA-General Aviation	*BU -Basic Utility*
PR-Commercial Service-Primary	*GU-General Utility*
CM-Commercial Service-Other	*S-Short Haul*
RL-Reliever	*L-Long Haul*

[3] *VOR = Very High Frequency Omnidirectional Range*
DME= Distance Measuring Equipment
VFR = Visual Flight Rules
ILS = Instrument Landing System

2.7.2 Surrounding Airspace

Figure 2-3 provides a depiction of the airspace surrounding the Grand Canyon West Airport. The nearest VOR's as shown in the figure are Peach Springs, Kingman, Boulder City, and Mormon Mesa. Several Victor routes extend from each of these VOR's to other area navigational aids or airports. Airspace within the Grand Canyon National Park is restricted as described in Section 2.7.4 below and is also identified in Figure 2-4 and 2-5.

2.7.3 Airspace Jurisdiction

The Grand Canyon West Airport is located within the jurisdiction of the Los Angeles Control Center (ARTCC) and the Prescott Flight Service Station (FSS). The current frequencies for Los Angeles ARTCC are 124.2 and 124.85. The altitude of radar coverage by the Los Angeles ARTCC may vary as a result of the FAA navigational/radar facilities in operation, weather conditions, and surrounding terrain. The Prescott FSS provides additional weather data and other pertinent information to pilots on the ground and enroute. Pilots can contact the Prescott FSS directly on radio frequency 122.4, or through the remote communications outlet (RCO) at Peach Springs by transmitting on 122.15 and receiving on 112.0

2.7.4 Airspace Restrictions

The airspace encompassing the perimeter of the Grand Canyon falls under Special Federal Aviation Regulations (SFAR). The flight restrictions, specified in SFAR 50-2-Grand Canyon National Park Special Flight Rules, apply to all aircraft operations below 14,000 feet mean sea level (MSL). Aircraft operating within this airspace must adhere to specific flight paths and altitudes prescribed by this regulation and depicted in the Grand Canyon VFR Aeronautical Chart. Figure 2-4 identifies the restricted airspace in relation to the surrounding region. Figure 2-5 depicts the required flight paths and altitudes within Grand Canyon National Park airspace adjacent to Grand Canyon West Airport. There are no Military Operating Areas (MOAs) or restricted military airspace in the area. Class B airspace is located to the west, surrounding the Las Vegas area.

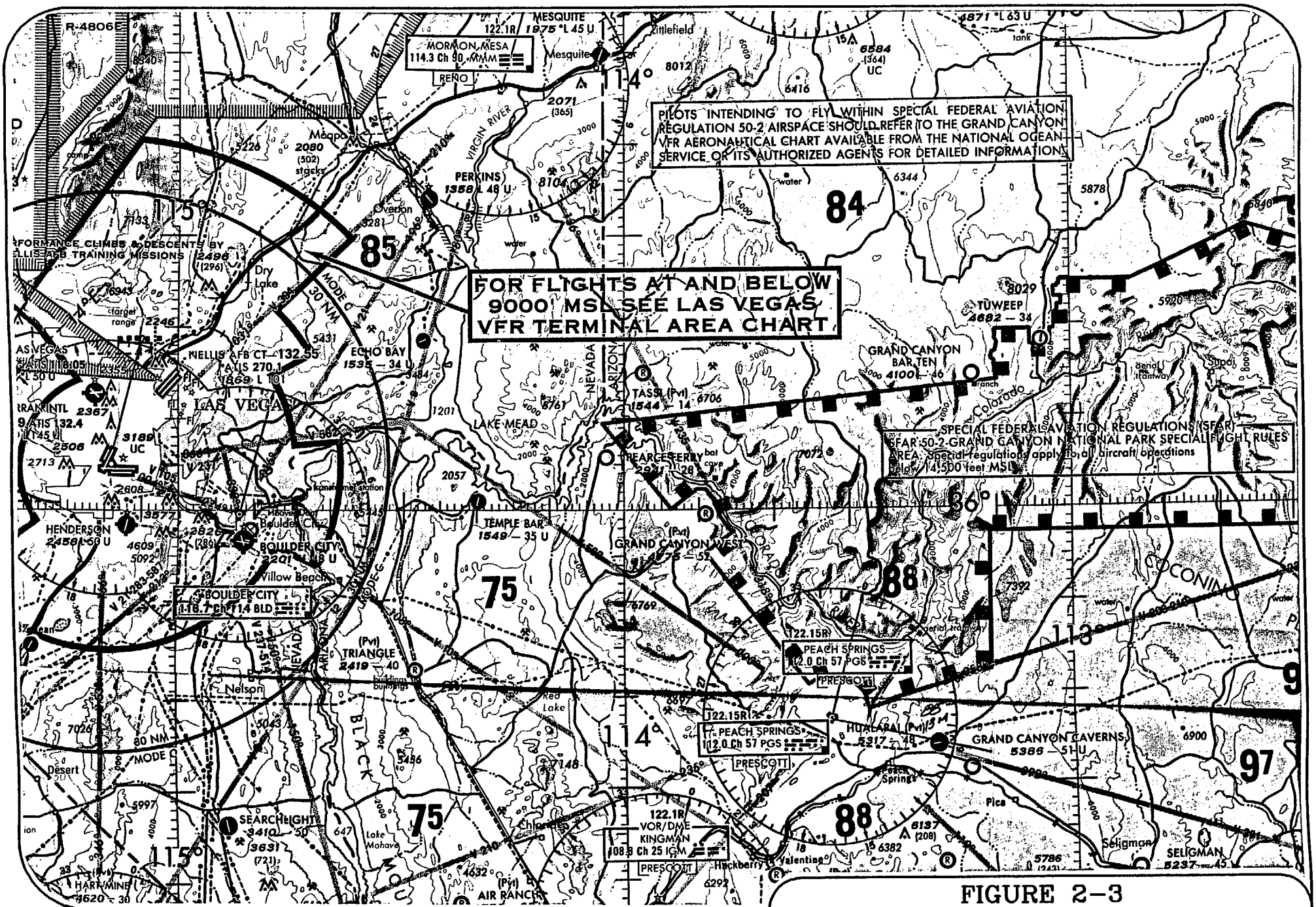


FIGURE 2-3
SURROUNDING AIRSPACE SYSTEM

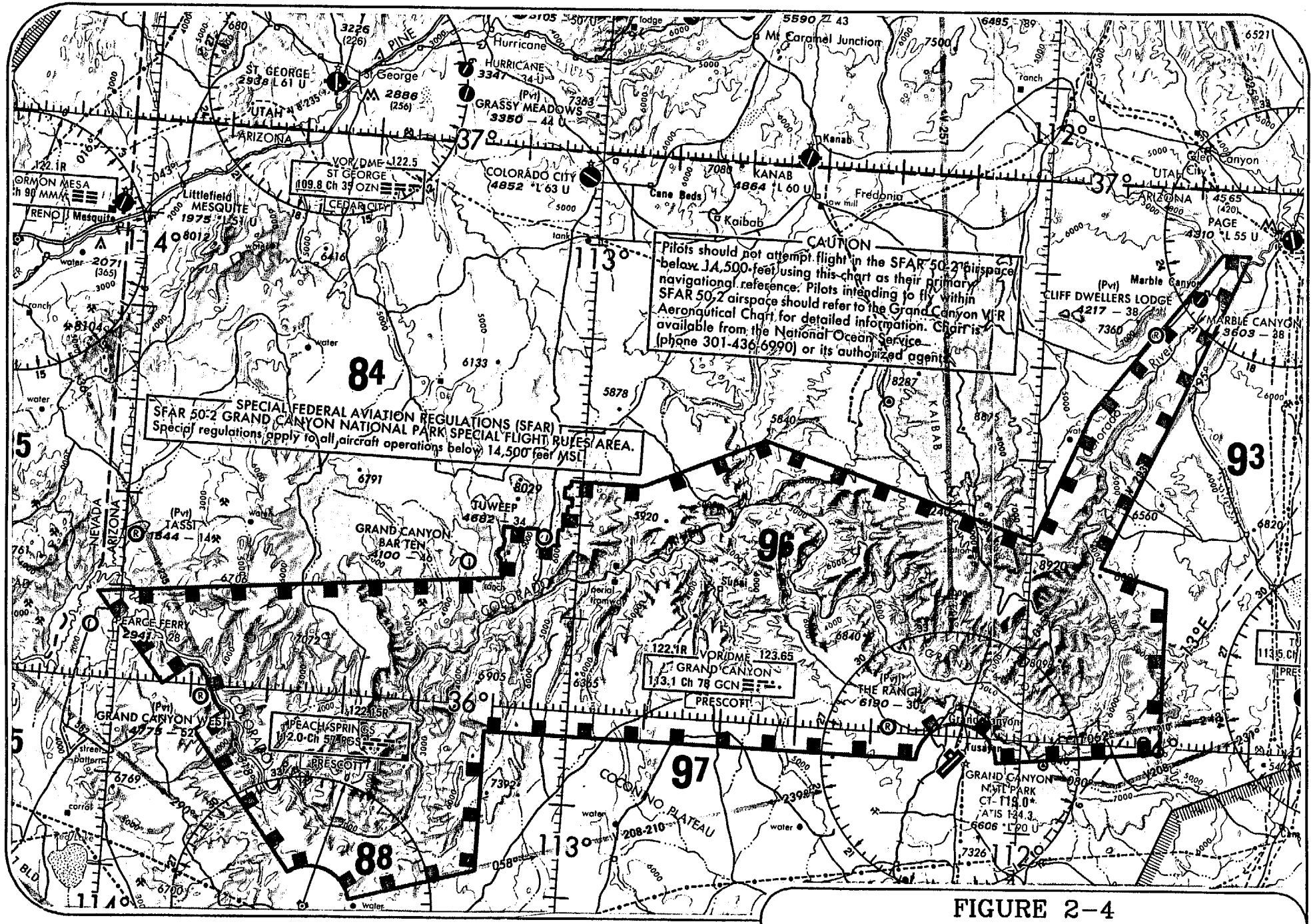


FIGURE 2-4
SFAR 50-2 AIRSPACE - GCNP

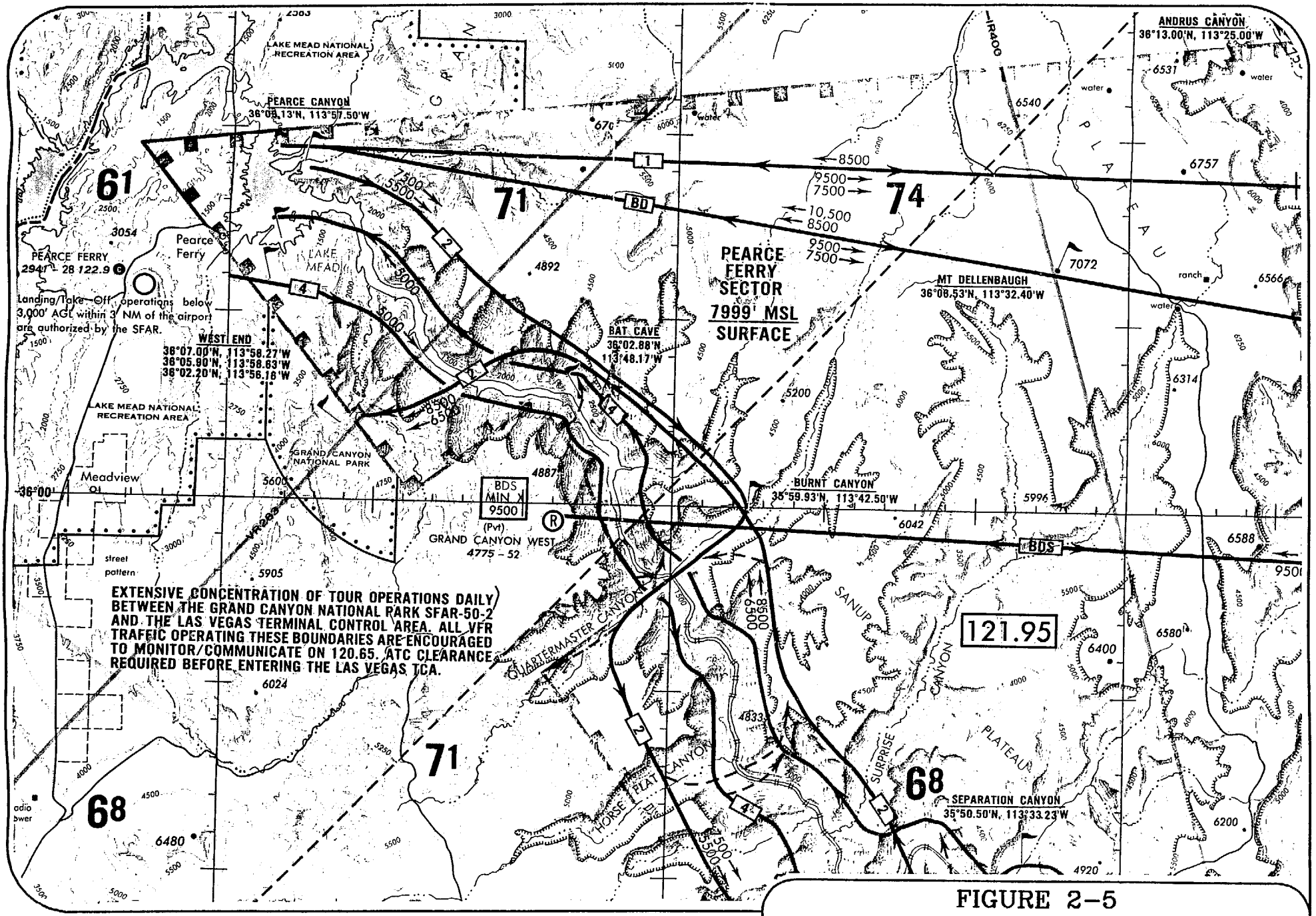


FIGURE 2–5
AERIAL FLIGHT TOUR ROUTES

2.8 AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

2.8.1 Fire Fighting

The Hualapai Volunteer Fire Team (HVFT) is responsible for emergency situations at the Grand Canyon West Airport. The Team consists of ten volunteers, five of which have received live fire training through the State of Arizona. Additionally, the fire coordinator has received incident management training provided by the State. The department currently has two pumper trucks, a 1968 Boardman and a 1982 Ford recently acquired through government surplus channels. They have carrying capacities of 500 gallons and pumping capability of 60 gallons per minute (GPM) each. The 1968 truck is projected for potential relocation to the Grand Canyon West site should appropriately trained personnel become available. The 1982 Ford would be foam capable with the acquisition of a foam converter device. The 1968 Boardman is not foam capable and none of the firefighters on the HVFT have been trained in foam application. Response time to the Grand Canyon West Airport for the fire department is approximately two hours due to the poor condition of the access roads. The HVFT maintains an informal mutual aid agreement with the Dolan Springs Fire Department located near U.S. Highway 93 north of Kingman. Due to their proximity, and the access roads to Grand Canyon West, the response time for Dolan Springs Fire Department is approximately 30 minutes to one hour.

2.8.2 Ambulance Service

The Hualapai Tribal Emergency Medical Service is collocated with the Hualapai Volunteer Fire Team in Peach Springs. The ambulance service currently has 7 full-time and 8 part-time employees. Full-time employees include three Paramedics, three Emergency Medical Technicians (EMT's), and one Intermediate EMT. Part-time personnel include six Paramedics, and two EMT's. The service has five ambulance vehicles, including two Type II van style ambulances, two Type-III box style ambulances, and one suburban style vehicle used as a rescue vehicle. Response time to Grand Canyon West is approximately one hour due to the poor access roads to the site. They also have an informal mutual aid agreement with the Dolan Springs Fire Department and EMS Service located near U.S. Highway 93 north of Kingman. Due to their proximity, and the access roads to Grand Canyon West, the response time for Dolan Springs EMS is approximately 30 minutes.

2.8.3 Airport Security

There are currently no law enforcement officers or security guards located at the Grand Canyon West Airport. Airport management and maintenance personnel notify the Bureau of Indian Affairs Police of any suspicious activity.

The Bureau of Indian Affairs (BIA) Law Enforcement Police Department provides police coverage throughout the Hualapai Reservation. The police

station is located in Peach Springs and has a response time to Grand Canyon West of approximately 45 minutes. Responses to Grand Canyon West are by request only; there are no scheduled patrols to the site. There are currently three full-time police officers on staff and two additional officers on loan from other departments. The department has seven patrol cars and provides 24 hour coverage with one officer on duty per eight hour shift.

The BIA Law Enforcement Police Department also has an informal mutual aid agreement with the Arizona Department of Protective Services, of Kingman, who support them on request.

2.9 METEOROLOGICAL CONDITIONS

Meteorological conditions have a direct impact on the operational characteristics of an airport. These conditions determine the regulations under which operations may be conducted, the frequency of use for each operational configuration, and the instrumentation required to assist aircraft in landing and departing.

2.9.1 Local Climatological Data

The area around Grand Canyon West experiences a mainly dry climate. Average annual precipitation for the area, as reported in Kingman, is approximately 9.35 inches. Daily maximum temperatures from October to March average 64°F, and from April to September average around 88°F. The average daily minimum temperature is 31.4°F (January), and the average daily maximum temperature of the hottest month is 97.4°F (July).

Density Altitude: An extremely important meteorological factor to pilots is density altitude. Density altitude is not a height reference. Rather, it is used as an index of aircraft performance. Air density is determined by air pressure, temperature, and humidity. As you increase altitude, the air density decreases. However, air density also decreases with high temperatures and high humidity. This means that high altitudes or conditions of high temperature or humidity cause the air to be thinner than at lower altitudes, temperatures, or humidities. The combination of high temperatures, high humidity, and increased altitude result in an increasing high density altitude condition. High density altitude reduces performance in all types of aircraft.

The results of a high density altitude include increased takeoff and landing rolls and a reduced rate of climb. Density altitude is most dangerous when other contributing factors are involved, such as heavy loads, calm winds, short runways, unfavorable runway conditions, and obstructions near the end of the runway. Density altitude is a concern at the Grand Canyon West Airport, given its elevation, high summer temperatures, and runway length. Runway length, however, is one factor related to density altitude that can be controlled.

2.9.2 Ceiling and Visibility Conditions

Ceiling and visibility conditions at the Grand Canyon West Airport are important considerations since the occurrence of low ceiling and/or poor visibility conditions limit the use of the airport to instrument approach and departure operations until conditions change. Under poor visibility conditions or Instrument Meteorological Conditions (IMC), the pilot must operate under Instrument Flight Rules (IFR), rather than Visual Flight Rules (VFR). Under Instrument Meteorological Conditions, the pilot maneuvers the aircraft through reference to instruments in the aircraft and navigational aids on the ground. The airport must be closed for use when conditions are worse than the published IFR minimums for that airport. When flight conditions are VFR, the pilot can maneuver the aircraft by reference to the horizon and objects on the ground.

Grand Canyon West Airport has visual approaches which may only be utilized under VFR conditions, when ceilings are above minimums. Definitions for the weather conditions which affect Grand Canyon West Airport are listed below.

- VFR - Visibility of three statute miles with the distance from clouds of 500 feet below, 1,000 feet above, and 2,000 feet horizontal.

- Below Minimums - Ceiling is less than the defined ceiling or visibility less than the minimums described above for each specific category of aircraft.

2.9.3 Runway Wind Coverage

Wind direction and speed determine the desired alignment and configuration of the runway system. Aircraft land and take off into the wind and therefore can tolerate only limited crosswind components (the percentage of wind perpendicular to the runway centerline). The ability to land and take-off in crosswind conditions varies according to pilot proficiency and aircraft type.

An accurate analysis of wind data must be made in order to determine the orientation and number of runways required. The FAA Advisory Circular 150/5300-13 recommends that a runway should yield a 95 percent wind coverage under stipulated crosswind components. If one runway does not meet this 95 percent coverage, then construction of an additional runway may be advisable. The crosswind component of wind direction and velocity is the resultant vector which acts at a right angle to the runway. It is equal to the wind velocity multiplied by the trigonometric sine of the angle between the wind direction and the runway direction. The allowable crosswind component for each Airport Reference Code is shown in Table II-7.

TABLE II-7
ALLOWABLE CROSSWIND COMPONENT

Allowable Crosswind in Knots	Airport Reference Code
10.5 Knots	A-I & B-I
13 Knots	A-II & B-II
16 Knots	A-III, B-III, & C-I through D-III
20 Knots	A-IV through D-VI

Source: FAA AC 150/5300-13.

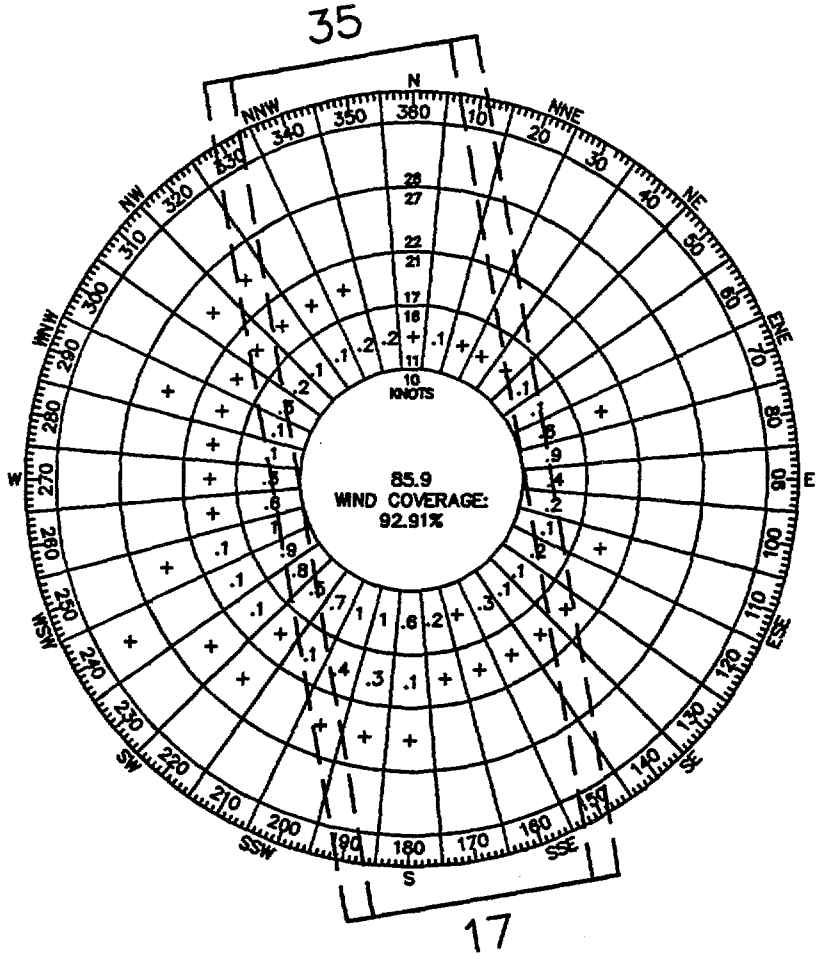
The Grand Canyon West Airport does not have any wind collection or recording equipment on site. Therefore, this Airport Master Plan will rely on information obtained from current airport users, airport management, previous studies, and data obtained from the closest wind data collection facility in Nelson, Arizona, which is located approximately 51 miles southeast of Grand Canyon West Airport.

A master plan and site selection study for a resort complex at Grand Canyon West completed in 1994 reported prevailing winds ranging from calm to 35 MPH out of the north during wintertime and prevailing winds out of the south at calm to 35 MPH during the summertime. This correlates with preliminary reports obtained from pilots at Lake Mead Air and airport management personnel.

Wind data collected at Nelson, Arizona was obtained from the Arizona Department of Environmental Quality. Analysis of this data generated a wind rose, Figure 2-6, resulting in a 10.5 knot crosswind coverage of 92.19 percent and a 13.0 knot crosswind coverage of 96.91 percent for Runways 17/35 at Grand Canyon West; which further concurs with previous studies and reports.

2.10 AIRPORT IMAGINARY SURFACES

Federal Aviation Regulations (FAR) Part 77 establishes several Imaginary Surfaces that are used as a guide to provide a safe, unobstructed operating environment for aviation. These surfaces, which are typical for civilian airports, are shown in Figure 2-7. The Primary, Approach, Transitional, Horizontal, and Conical Surfaces identified in FAR Part 77 are applied to each runway at both existing and new airports on the basis of the type of approach procedure available or planned for that runway and the specific FAR Part 77 runway category criteria. For the purpose of this section, a visual/utility runway is a runway that is constructed for and intended to be used by propeller driven aircraft of 12,500 pounds maximum gross weight and less. A visual runway is a runway intended for the operation of aircraft weighing more than 12,500 pounds and using only visual approach procedures, with no straight-in instrument approach procedure and no instrument designation indicated on an FAA approved airport layout plan, a military service approved military airport layout plan, or by any planning



GRAND CANYON WEST

ALL WEATHER WIND ROSE

SOURCE: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
COLLECTED AT NELSON, ARIZONA
PERIOD: JANUARY 1994 THROUGH SEPTEMBER 1996
10.5 KNOT CROSSWIND COVERAGE RUNWAY 17/35 = 92.91%
13.0 KNOT CROSSWIND COVERAGE RUNWAY 17/35 = 96.19%

FIGURE 2-6
WIND ROSE

document submitted to the FAA by competent authority. A nonprecision instrument runway is a runway with an approved or planned straight-in instrument approach procedure which has no existing or planned precision instrument approach procedure.

Runway 17/35 is currently classified as a visual runway with visual approaches. The runway's present design aircraft group as stated earlier in this chapter is a B-I with aircraft weighing 12,500 pounds or less.

2.10.1 Primary Surface

The Primary Surface is an imaginary surface of specific width longitudinally centered on a runway. Primary Surfaces extend 200 feet beyond each end of the paved surface of runways, but do not extend past the end of non-paved runways. The elevation of any point on the Primary Surface is the same as the elevation of the nearest point on the runway centerline. The existing width of the Primary Surface at Grand Canyon West Airport for Runway 17/35 is 250 feet.

2.10.2 Approach Surface

The Approach Surface is a surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the Primary Surface. An Approach Surface is applied to each end of the runway based upon the type of approach available or planned for that runway. The inner edge of the surface is the same width as the Primary Surface. It expands uniformly to a width corresponding to the FAR Part 77 runway classification criteria.

The existing dimensions for the Approach Surfaces for Runway 17 and Runway 35 measure 250 feet at the inner width, 1,250 feet at the outer width, 5,000 feet in length, and have a slope of 20 to 1.

2.10.3 Transitional Surface

The Transitional Surface extends outward and upward at right angles to the runway centerline from the sides of the Primary and Approach Surfaces at a slope of 7:1 and ends at the Horizontal Surface.

2.10.4 Horizontal Surface

The Horizontal Surface is considered necessary for the safe and efficient operation of aircraft in the vicinity of an airport. As specified in FAR Part 77, the Horizontal Surface is a horizontal plane 150 feet above the established airport elevation. The perimeter is constructed by arcs of specified radius from the center of each end of the Primary Surface of each runway. The radius of each arc is 5,000 feet for runways designated as utility or visual and 10,000 feet for all other runways. The elevation of the Grand Canyon West Airport is 4775 feet MSL. The Horizontal Surface is 4,925 feet MSL, and the radii of the arcs

are 5,000 feet for both Runways 17/35.

2.10.5 Conical Surface

The Conical Surface extends outward and upward from the periphery of the Horizontal Surface at a slope of 20:1 for a horizontal distance of 4,000 feet. The Conical Surface elevations at the Grand Canyon West airport are 4,975 feet MSL for the inner surface and 5,175 feet MSL for the outer surface.

2.11 OBJECTS AFFECTING NAVIGABLE AIRSPACE

The criteria for objects affecting navigable airspace (obstructions) contained in FAR Part 77 apply to existing and proposed manmade objects, and objects of natural growth and terrain. These criteria indicate the "critical" areas in the vicinity of airports which should be kept free of obstructions. "Secondary" areas may contain obstructions, if they are determined to be non-hazardous by an FAA aeronautical study and if they are marked and lighted as specified in the aeronautical study determination. Airfield navigational aids or lighting and visual aids by nature of their location may constitute obstructions, but these objects do not violate FAR Part 77 requirements as they are essential to the operation of the airport.

The Approach Surfaces of both Runway 17 and Runway 35 are penetrated by several bushes and trees growing near the ends of the runways. The Primary Surface is also penetrated by several trees, the two foot stone berms deposited along the runway edges from grading, and by aircraft parking on the western portion of the aircraft parking apron, which is currently located immediately adjacent to the runway. The Transitional Surface is penetrated by several bushes and trees on both the east and west side of the runway, and by the terminal building on the east side of the runway. A National Ocean Service's Obstruction Chart for the Grand Canyon West Airport was not available for reference; however, the obstructions will be shown on the Part 77 Airspace Drawing which will be completed as part of this Airport Master Plan.

2.12 RUNWAY & TAXIWAY STANDARDS

As previously discussed, the Airport Reference Coding (ARC) system is used to relate airport design criteria to the operational and physical characteristics of the critical aircraft intended to operate at the airport. The design or critical aircraft must also have over 500 itinerant operations per year to be considered the design aircraft, and usually has the largest wingspan and the fastest approach speed. Those aircraft having an ARC of B-I and weighing less than 12,500 pounds should be considered the existing design aircraft for Runway 17/35. Runway standards for Grand Canyon West Airport were developed utilizing FAA guidelines to provide the airport operator with a selection of various widths, clearances and separations related to the critical aircraft design group and approach category for the airport.

2.12.1 Obstacle Free Zone (OFZ) and Object Free Area (OFA)

As established in FAA Advisory Circular 150/5300-13, Chapter 3, the OFZ is a three dimensional volume of airspace which supports the transition of ground to airborne aircraft operations. The clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible visual NAVAIDS (Navigational Aids) that need to be located in the OFZ because of their function.

The Runway OFZ is similar to the FAR Part 77 Primary Surface insofar that it represents the volume of space longitudinally centered on the runway. It extends 200 feet beyond the end of each runway. For the Grand Canyon West Airport, the width of the Runway OFZ is 250 feet.

The Runway Object Free Area (OFA) is a two dimensional ground area surrounding the runway. The runway OFA standard precludes parked airplanes, agricultural operations, and objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. The OFA for Runway 17/35 is 400 feet wide and extends 240 feet past the runway threshold.

Presently, the aircraft parking apron, stone berm deposits along the runway edges, and natural vegetation growth along the runway edges and beyond the runway ends penetrate the OFZ and OFA.

The partial parallel taxiway to Runway 17/35 has a Taxiway Object Free Area (TOFA) width of 89 feet for existing conditions. Natural vegetation growth within this area as well as its proximity to the runway which is discussed in Section 2.12.4, are penetrations of the TOFA.

2.12.2 Runway Protection Zones (RPZ)

The RPZ is trapezoidal in shape and centered about the extended runway centerline. It begins 200 feet beyond the end of the area usable for takeoff or landing. The RPZ dimensions are functions of the design aircraft, type of

operation, and visibility minimums, and are specified in FAA AC 150/5300-13, Table 2-4.

Runway 17/35 requires Runway Protection Zones for visual approach minimums and aircraft with an Airport Reference Code of B-I. This criteria results in Runway Protection Zones with dimensions of 250 feet at the inner width, 450 feet at the outer width, and a length of 1,000 feet.

While it is desirable to clear all objects from the RPZ, uses such as agricultural operations (provided they do not attract birds), and golf courses are normally acceptable. Land uses which are prohibited from the RPZ include residences and places of public assembly, such as churches, schools, hospitals, office buildings, shopping centers, and other uses with similar concentrations of people.

The land on which the RPZs occur presently meet the FAA recommendations.

2.12.3 Safety Areas

Runway and Taxiway Safety Areas are a defined surface surrounding the runway or taxiway prepared specifically to reduce the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway or taxiway.

The Safety Areas must be:

- Cleared and graded and have no potentially hazardous surface variations
- Drained so as to prevent water accumulation
- Capable, under dry conditions, of supporting snow removal equipment, ARFF equipment and the occasional passage of aircraft without causing structural damage to the aircraft
- Free of objects, except for objects that need to be located in the runway or taxiway safety area because of their function

Runway 17/35 has a Safety Area which is 120 feet wide and extends 240 feet past the runway threshold. The same items which penetrate the Primary Surface, Object Free Zone, and Object Free Area are deficiencies in the Runway Safety Area.

The width of the Taxiway Safety Area, as recommended by AC 150/5300-13 is 49 feet. Measures should be taken throughout the completion of the partial parallel taxiway to ensure the requirements listed above are met.

2.12.4 Runway-Parallel Taxiway Separation Standards

Separation standards for the runway and parallel taxiway are designed as such to satisfy the requirement that no part of an aircraft (tail tip, wing tip) on the taxiway centerline is within the runway obstacle free zone (OFZ). The distance is measured from runway centerline to taxiway centerline and is based on the Aircraft Design Group. Based on the existing aircraft design group at Grand Canyon West (Design Group-I) the runway-taxiway separation standard is 225 feet.

A partial parallel taxiway is currently under construction at Grand Canyon West. It is being constructed at a runway-taxiway separation of 120 feet, which does not meet the FAA design criteria. The width of this taxiway is 35 feet, which does meet the FAA minimum design width of 25 feet.

2.13 LINE OF SIGHT

The FAA Advisory Circular 150/5300-13, Airport Design, sets guidelines for appropriate runway gradients to allow for adequate line of sight along the runway surface. These guidelines state that along individual runways, an acceptable runway profile permits any two points five feet above the runway centerline to be mutually visible for the entire runway length. A centerline profile was drawn for Runway 17/35 at Grand Canyon West Airport, and the line of sight is acceptable according to FAA standards.

2.14 SUMMARY OF DIMENSIONAL CRITERIA

The following Table II-8 summarizes the dimensional standards described above for the existing conditions (according to the specified ARC) at Grand Canyon West Airport.

TABLE II-8
SUMMARY OF DIMENSIONAL CRITERIA
GRAND CANYON WEST AIRPORT

Standard	Existing Dimensions	
Horizontal Surface		
Elevation	4,975 feet MSL	
Radius of arcs	5,000 feet	
Conical Surface		
Slope	20:1	
Inner elevation	4,975 feet MSL	
Outer elevation	5,175 feet MSL	
Transitional Surface - Slope	7:1	
Primary Surface		
Width	250 feet	
Length beyond runway end	0 feet	
Approach Surface	Runway 17	Runway 35
Inner width	250 feet	250 feet
Outer width	1,250 feet	1,250 feet
Length	5,000 feet	5,000 feet
Slope	20 : 1	20 : 1
Runway Obstacle Free Zone		
Width	250 feet	
Length beyond runway end	200 feet	
Runway Object Free Area		
Width	250 feet	
Length beyond runway end	240 feet	
Runway Protection Zone	Runway 17	Runway 35
Inner Width	250 feet	250 feet
Outer Width	400 feet	400 feet
Length	1,000 feet	1,000 feet
Runway Safety Area		
Width	120 feet	
Length beyond runway end	240 feet	
Taxiway Object Free Area		
Width	89 feet	
Taxiway Safety Area		
Width	49 feet	

Source: FAR Part 77 and FAA Advisory Circular 150/5300 -13, Airport Design